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CASE REPORT

Surgical Management of Premature Closure of the Distal Ulnar Growth Plate in a Growing Dog

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Summary

Surgical management of deformity due to premature closure of the distal ulnar growth plate in a growing dog is discussed. The method of management selected was ulnar diaphyseal ostectomy with transphyseal wiring of the distal radius. Elbow subluxatin and degenerative joint disease as a consequence of premature ulnar closure are also discussed.

Résumé

Correction chirurgicale de la fermeture prématurée de la plaque épiphysaire distale du cubitus, chez un chien en croissance

Les auteurs commentent l'intervention chirurgicale qu'ils choisirent pour corriger la difformité imputable à la fermeture prématurée de la plaque épiphysaire distale du cubitus, chez un chien en croissance. Leur approche consistait à sectionner la diaphyse du cubitus et à brocher la partie antérieure distale du radius, de façon à inclure la plaque épiphysaire dans leur procédé. Ils commentent aussi la subluxation du coude et la dégénérescence articulaire consécutives à cette condition.

Introduction

The most common complication of epiphyseal injury in the dog is premature closure of the distal ulnar growth plate (1,11). If such an injury occurs in a young, rapidly growing dog extensive deformity occurs due to the cessation of distal ulnar growth and continued growth of the radius. Typical deformities seen include progressive valgus deviation and external rotation of the carpus and foot. Radiographically, the distal radius has an exaggerated and cranial medial convexity and subsequent subluxations are noted in the elbow and carpal joints. The age of the dog at the time of injury and the growth potential of existing growth plates dictate the degree of deformity to be expected.

Premature closure of the distal ulnar growth plate occurs in injured dogs with an average age of less than four months (5,11,12). Closure of the growth plate usually occurs at three to four weeks after injury and gross deformity is noted two to three weeks after closure (5). Prompt surgical intervention is required to minimize bone deformity and prevent secondary degenerative joint disease in the elbow and carpus (4). This paper will discuss such a case.

History and Clinical Findings

On October 1, 1980 a male Old English Sheepdog was referred to the Western College of Veterinary Medicine (WCVM). The dog was four and one half months old and had been acutely lame six weeks previously. Radiographs had revealed a diaphyseal greenstick fracture of the left radius and the limb was bandaged for ten days.

Over the next few weeks, the owners noticed a progressive lateral displacement of the carpus and persistent lameness.

When presented at the WCVM, the pup had a valgus deformity of the lower left forelimb with external rotation of the carpus and paw. Radiographs (Figures 1 and 2) revealed that the left distal ulnar physis was partially closed and the affected limb was approximately 1.5-2 cm shorter than the normal limb. The radius, and to a lesser extent the ulna, was bowed in an anterior direction and the distal radial physis was beginning to distract cranially. The radial-humeral and ulnar-humeral articulations were subluxated and the trochlear notch was becoming elongated and shallow. The carpal bones were not deformed and no arthritic change was present, but the spatial relationships to the radius and ulna were drastically altered.

Ulnar diaphyseal ostectomy and transphyseal wiring of the distal radius were selected as the treatments for this case.

Surgical Procedure

The patient was routinely prepared and draped for aseptic surgery. A lateral approach was used to visualize the ulna prior to ostectomy (6). The inter-

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FIGURE 1. Anteroposterior view of affected limb with valgus deformity and normal (right side) limb for comparison.

FIGURE 2. Lateral view showing changes in the left forelimb typical of premature closure of the distal ulnar physis.

FIGURE 3. Lateral postoperative view showing ulnar diaphyseal ostectomy with distal radial transphyseal bridging.

osseous ligament between the radius and ulna was bluntly dissected to free the ulna and a Gigli wire saw was used to transect the ulna proximally and distally to allow removal of approximately half of its length.

A second incision was made over the antero-medical aspect of the distal radius and screw and wire transphyseal bridges were applied cranially and medially (Figure 3).

Closure of the incision sites was routine and the limb was bandaged.

Results

The dog was discharged on the fourth postoperative day with advice to restrict exercise to leash walks for the next two months and that additional surgery may be necessary.

Follow up radiographs six weeks postoperatively (Figures 4 and 5) showed improved humeral-ulnar and humeral-radial articulations. Moderate straightening of the limb, decreased cranial convexity of the radius and improved carpal articulations had occurred. The ulnar diaphysis was regenerating but bony union was not complete.

Nine months after the surgery the dog was returned to the WCVM. At this time the dog was walking normally and palpation of the affected leg failed to reveal any crepitus or pain in the elbow or carpus. Radiographs showed considerable improvement on the alignment of the radiocarpal and elbow joints (Figure 6). Bridging of the ulnar ostectomy site was almost com-

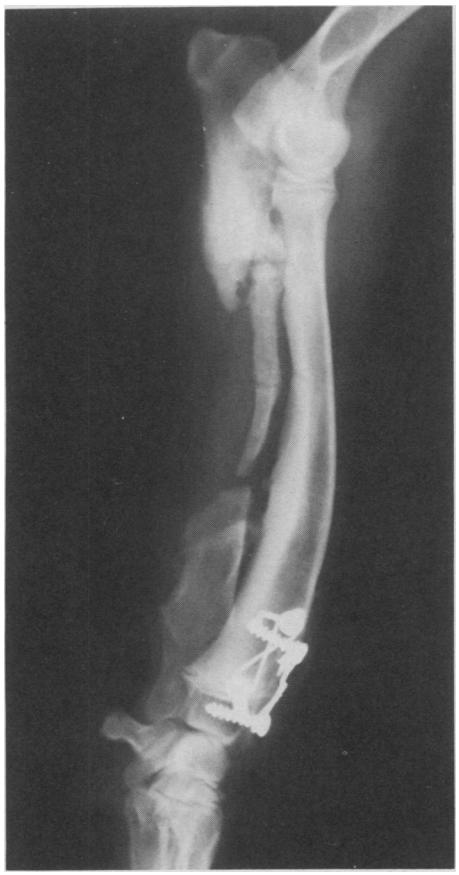

FIGURE 4. Lateral view six weeks postoperative.

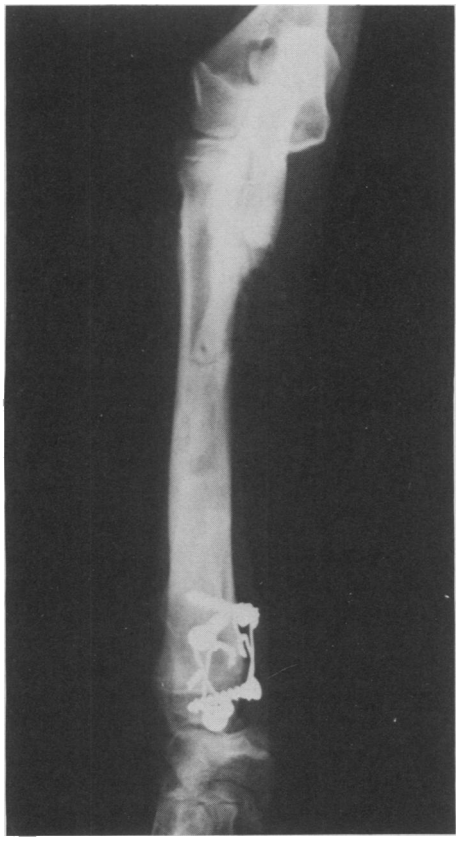

FIGURE 5. Anteroposterior view six weeks postoperative.

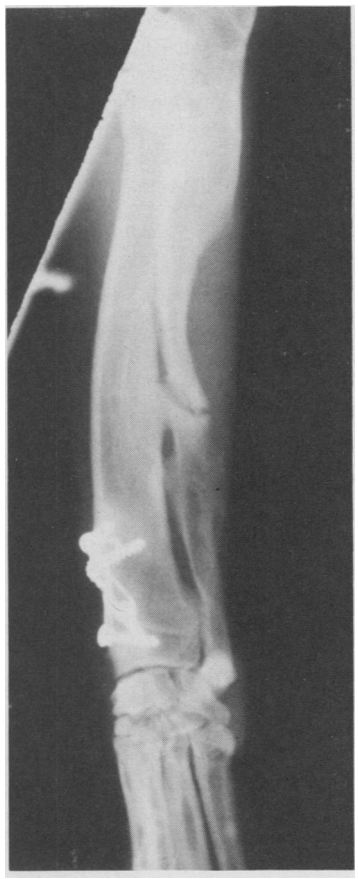

FIGURE 6. Lateral view nine months postoperative.

plete. The metal implants were removed from the distal radius and the dog was discharged to the owners.

Discussion

In the immature animal, it has been noted that epiphyseal separations or injuries are more common than fractures of the long bones or ligamentous injuries. This is attributed to the fact that the zone of chondrocyte hypertrophy in the growth plate has little structural support and offers a potential natural clevage line (2,4).

Separation of the distal ulnar growth plate is not a common finding. This growth plate in the dog has a unique conical appearance making it particularly prone to compressive insults rather than dislocation (11). This type of injury has been classified as type V according to the Salter-Harris classification and radiographic evidence is usually absent on initial evaluation (10).

Throughout the growing period, the ulna and radius maintain a dynamic relationship. The proximal radial growth plate contributes 30% to longitudinal growth while the distal growth plate contributes 70%. The relationship in the ulna is somewhat different with the proximal growth plate contributing 15% and the distal growth plate 85% (7,9). Furthermore, the 15% of growth from the proximal ulnar epiphysis contributes solely to the olecranon leaving the distal physis to match the growth rate of both radial epiphyses (11). For this reason any alteration of the growth rate of the distal ulnar physis rapidly leads to deformity in the limb.

Deformity due to premature closure of the distal ulnar growth plate in a growing dog requires prompt surgical attention. If the situation is allowed to persist, subluxation of the elbow leads to degenerative joint disease. The nutrition of articular cartilage depends upon normal joint contact and if contact between articular surfaces is lost, erosion of cartilage results. By the time changes in the elbow are apparent radiographically the articular cartilage has already undergone significant alterations (1).

Surgical management of growth defomity due to premature closure of the distal ulnar growth physis in a rapidly growing dog poses special problems. Deformities are more readily corrected in the mature animal using wedge osteotomy for rotational correction and oblique osteotomy to recover some loss in length (3,8,12). In the past repetitive ulnar osteotomies, ulnar osteotomy and progressive spread of the ulna or ulnar osteotomy with induced closure of the proximal radial physis have been suggested (3). The objectives behind all these techniques is to allow maximal radial growth while preventing further subluxation of the elbow.

The purpose of ulnar diaphyseal ostectomy was to preclude the need for repetitive osteotomies and allow normal elbow articulation. Transphyseal bridging of the distal radial growth plate was performed in this case to allow the remaining growth of this physis to aid in correcting the rotational defect of the limb and possibly prevent the necessity of a future wedge osteotomy.

Acknowledgments

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assistance in radiographic interpretation.

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ABSTRACT

Vaccination against TEME: humoral immunity and vaccine evaluation. L.R. Stephens and P.B. Little, (Ontario Veterinary College, Guelph, Ontario).

A method was devised by which TEME could be induced in 70% of cattle intravenously inoculated with *Haemophilus somnus*. For each experiment, minimally subcultured *H. somnus* was passaged through the CSF of a donor calf, and the fresh CSF used as inoculum. Serum antibodies were measured by direct and indirect agglutination, gel immunodiffusion, latex agglutination, and complement fixation tests. Twenty-three cattle with a range of preinoculation titers were inoculated intravenously with infective CSF containing 10^8 CFU *H. somnus*. Sixteen of the 23 cattle died and had lesions typical of naturally occurring TEME. Serum antibody levels were not related to susceptibility to the challenge in any of the tests used. In a second series of experiments, 18 cattle were vaccinated twice with a commercial *H. somnus* bacterin, 8 cattle were vaccinated once, and 14 cattle were unvaccinated controls. *H. somnus* passaged through CSF was intravenously inoculated into all cattle 4 weeks after the last vaccination. TEME occurred in 8 controls, 3 cattle vaccinated once, and 3 cattle vaccinated twice. Two vaccinations gave significant protection against the challenge. Small, but significant increases in serum CFT titers were seen following vaccination, but there was no change in agglutination titers. Serum antibody titers were not related to susceptibility to infection, regardless of vaccination status.

Scientific Program of the Canadian Veterinary Medical Association Convention, Winnipeg 1981.

CANADIAN VETERINARY MEDICAL ASSOCIATION

1982 Annual Meeting

Notice of Meeting

In conformity with By-Law 36 of the Canadian Veterinary Medical Association, notice is hereby given that the 1982 Annual Meeting of the Association will be held on Friday, July 9 in the Québec City Convention Centre. The meeting will convene at 13:15.

D.A. LANDRY, D.M.V.
Secretary-Treasurer
Ottawa, Ontario, April 1, 1982

ASSOCIATION CANADIENNE DES VÉTÉRINAIRES

Assemblée annuelle 1982

Avis de convocation

Conformément au Règlement 36 de l'Association canadienne des vétérinaires, avis est par la présente donné que l'Assemblée annuelle de l'Association en l'an 1982 aura lieu vendredi le 9 juillet au Centre municipal des congrès de Québec (Québec). L'assemblée débutera à 13h15.

D.A. LANDRY. D.M.V.
Secrétaire-trésorier
Ottawa (Ontario) le 1er avril 1982

ERRATUM

Can. vet. J. 22: 343. 1981.

A simple and inexpensive medium for the cultivation of *Erysipelothrix rhusiopathiae*

The Glucose-Tween-80-Riboflavin agar composition should have read: "The medium containing trypton (oxoid) 20 g, glucose 20 g, beef extract 3 g, yeast extract 5 g, Tween-80 10 g, riboflavin 40 mg, and agar 18 g, in 1 000 mL of distilled water pH 7.4-7.6, was autoclaved at 10 lb pressure for 20 to 30 minutes."

We apologize for any inconvenience caused.